CLAIMS

What is claimed is:

1. A system for use in combination with an extracorporeal blood flow circuit, the system comprising:

a) one or more automated sensor modules adapted to monitor, directly or indirectly, the presence of one or more blood parameters, and

b) one or more regulating modules adapted to affect the presence, concentration and/or activity of one or more blood parameters.

2. A system according to claim 1 wherein the monitored blood parameter and the regulated blood parameter are the same.

3. A system according to claim 1 wherein the blood parameter is selected from the group consisting of blood analytes and blood functions.

4. A system according to claim 3 wherein the blood analytes are selected from the group consisting of biomolecules, drugs and metabolites, and the blood functions are selected from the group consisting of clotting time, fibrinolytic activity, and immune response.

5. A system according to claim 4 wherein the blood analytes comprise heparin concentration and aprotinin concentration, and the blood functions comprise clotting time.

6. A system according to claim 1 wherein the sensor module is adapted to incorporate flow injection analysis ("FIA") techniques, and comprises: i) a blood withdrawal component with in-line access, ii) an analytical component, and iii) a readout component.

7. A system according to claim 6 wherein the sensor module provides semicontinuous and/or continuous sampling of the blood, in order to provide substantially real-time digital output readings of the monitored parameter.

8. A system according to claim 1 wherein the regulating modules comprise a filter adapted to remove inflammation mediators from the blood, the filter providing a support surface selected from the group consisting of a specific binding ligand or hydrophobic surface.

9. A system according to claim 8 wherein the inflammation mediators are selected from the group consisting of anaphylatoxins, chemokines, and proinflammatory cytokines, and the support surface comprises a hydrophobic surface selected from the group consisting of acrylic polymers selected from the group consisting of acrylonitrile polymers, copolymers and polymer blends; polysulfones; polyamides selected from the group consisting of Nylon-6, Nylon-6,6, Nylon-11, Nylon-12, Nylon 6,9, Nylon-12; and acrylic and methacrylic ester polymers.

10. A system according to claim 1 comprising a regulating module adapted to remove heparin from the blood stream by anionic exchange of heparin with an immobilized positively charged species on the surface of a membrane.

11. A method for monitoring and regulating blood parameters in the course of extracorporeal blood flow, the method comprising:

a) providing an extracoporeal blood flow circuit comprising, in the order of blood flow, a reservoir, a pump, and oxygenator, a filter, together with associated tubing, connectors and controls,

b) providing a system comprising

i) one or more automated sensor modules adapted to monitor, directly or indirectly, the presence of one or more blood parameters, and

ii) one or more regulating modules adapted to affect the presence, concentration and/or activity of one or more blood parameters.

c) employing the sensor module(s) to monitor one or more blood parameters, and

d) employing the filter module(s) to affect the presence, concentration and/or activity of one or more blood components.

12. A method according to claim 11 wherein the monitored blood parameter and the regulated blood parameter are the same.

13. A method according to claim 11 wherein the blood parameter is selected from the group consisting of blood analytes and blood functions.

14. A method according to claim 13 wherein the blood analytes are selected from the group consisting of biomolecules, drugs and metabolites, and the blood functions are selected from the group consisting of clotting time, fibrinolytic activity, and immune response.

15. A method according to claim 14 wherein the blood analytes comprise heparin concentration and aprotinin concentration, and the blood functions comprise clotting time.

16. A method according to claim 11 wherein the sensor module is adapted to incorporate flow injection analysis ("FIA") techniques, and comprises: i) a blood withdrawal component with in-line access, ii) an analytical component, and iii) a readout component.

17. A method according to claim 16 wherein the sensor module provides semicontinuous and/or continuous sampling of the blood, in order to provide substantially real-time digital output readings of the monitored parameter.

18. A method according to claim 11 wherein the regulating modules comprise a filter adapted to remove inflammation mediators from the blood, the filter providing a support surface selected from the group consisting of a specific binding ligand or hydrophobic surface.

19. A method according to claim 18 wherein the inflammation mediators are selected from the group consisting of anaphylatoxins, chemokines, and proinflammatory cytokines, and the support surface comprises a hydrophobic surface selected from the group consisting of

acrylic polymers selected from the group consisting of acrylonitrile polymers, copolymers and polymer blends; polysulfones; polyamides selected from the group consisting of Nylon-6, Nylon-6,6, Nylon-11, Nylon-12, Nylon 6,9, Nylon-12; and acrylic and methacrylic ester polymers.

20. A method according to claim 1 comprising a regulating module adapted to remove heparin from the blood stream by anionic exchange of heparin with an immobilized positively charged species on the surface of a membrane.

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